Pest Leaflet

Pacific Forestry Centre 506 West Burnside Road Victoria, B.C.

Terminal and Root-Collar Weevils of Lodgepole Pine

in British Columbia

R.W. Duncan

Introduction

Lodgepole pine has become increasingly important as a source of timber and pulpwood in British Columbia. More intensive management of lodgepole pine stands will necessitate careful monitoring of pests that might otherwise reduce the quality or quantity of timber or fibre produced.

The lodgepole terminal weevil, *Pissodes terminalis* Hopping, feeds in the current year's terminal growth causing dieback, height growth loss and consequent deformity in the main stem. In the Cariboo forest region up to 40% of the trees in some stands have been attacked.

Warren's rootcollar weevil, *Hylobius warreni* (Wood)[1], feeds in the cambium of the root-collar area on young to mature pine and spruce, causing growth reduction or mortality. Numerous plantations throughout the central interior have experienced mortality levels in excess of 10%.

[1] Another less abundant root-collar weevil, *Hylobius pinicola* (Couper), is similar in habit and appearance but is distinguished by having well-developed hind wings, which are lacking in *H. warreni*.

Lodgepole terminal weevil

Hosts and distribution

This weevil is found throughout much of western North America from Manitoba to British Columbia and from the Northwest Territories to Colorado and California. In British Columbia it is most common in interior regions south of 56° latitude.

Host plants include immature lodgepole pine, *Pinus contorta* Dougl., and Jack pine, *Pinus banksiana* Lamb..

Description

Egg: Sub-globose, 0.5 by 0.8 mm, translucent white.

Larva: Creamy white with tan head capsule; it lacks developed legs and is about 10 mm long when mature (Fig. 1a).

Pupa: White, about the same size and form as the adult, bearing a prominent snout (Fig. 1b).

Government of Canada Gouvernement du Canada
Canadian Forestry Service Service canadien des forêts

Fig. 1. Mature lodgepole terminal weevil larva and pupa. (Scale in mm)

Fig. 2. Lodgepole terminal weevil.

Adult: 5-7 mm long, cylindrical with a posteriorly tapered body and a prominent elongate proboscis, mottled reddish brown with a more or less continuous band of white and yellow scales near the vertex of the elytral declivity (Fig. 2).

Life history and habits

The lodgepole terminal weevil has one generation per year. Adults emerge in late spring or early summer and complete a period of maturation feeding on developing terminal growth before mating. The females then excavate oviposition punctures in each of which a single egg is usually placed. These punctures, located on the new terminal growth, are similar to feeding punctures but are sealed with a brown exudate. The eggs hatch in about two weeks, and the young larvae begin to tunnel randomly in the phloem and cortex without breaking through the bark. By the second instar, the larvae begin mining upwards in a spiral fashion completely girdling the terminal shoot. During the third and fourth instars the larvae migrate to the pith where they complete their development. Elliptical pupal chambers enclosed in wood particles are constructed in the pith (Fig. 3) and may be located throughout the length of the terminal shoot. Usually only one or two larvae survive to maturity in each leader, and in many leaders all the larvae die before completing development. In British Columbia pupation occurs in fall or spring. Most weevils overwinter as larvae but they may overwinter as pupae or adults.

Fig. 3. Pupa in pith of terminal.

Damage and detection

The lodgepole terminal weevil attacks and kills the current year's terminal growth on immature trees 2 to 7 m high. Some preference is shown for vigorous trees in low-density stands. Usually a single branch in the whorl immediately below the attacked leader assumes apical dominance, producing a crook in the stem; infrequently, two or more laterals compete for dominance, resulting in a forked or candelebra-shaped crown.

Deformities result in a reduction of merchantable volume through lost height growth and cause some degrade of lumber due to grain aberrations at the site of the crook (Maher 1979).

Careful examination of the leaders for feeding and oviposition punctures can provide early evidence of attack. Weevil damage is often indicated by a gradual fading and twisting of the leaders, which turn red by the following spring. Crooks and forks in the stem may indicate previous attacks.

The white pine weevil, *Pissodes strobi* (Peck), may also attack and kill the leader on lodgepole pine, but damage differs from that of *P. terminalis* as oviposition and larval feeding occurs in the previous year's growth, killing it and the current year's terminal growth.

Control

No practical chemical or biological controls of the lodgepole terminal weevil are available. However, natural mortality of the weevil is often high. At least seven species of hymenopterous parasites have been recorded. Resin flow within an attacked leader often causes weevil mortality.

Fig. 4. Mature root-collar weevil larva. (scale in mm)

Fig. 5. Warren's root-collar weevil.

Warren's Root-Collar Weevil

Hosts and distribution

Warren's root-collar weevil, *Hylobius warreni* attacks several species of native and exotic pines and spruces; true firs and larch have also been reported as hosts. In British Columbia lodgepole pine is the most common host, followed by Engelmann and white spruce.

This weevil is distributed throughout the forested areas of Canada, particularly in the boreal and sub-boreal forest zones. In some mature lodgepole pine stands almost every tree has sustained some weevil damage during its life.

Description

Egg: Ovoid, 1.3 by 2.2 mm, pearly white.

Larva: 2 cm long at maturity (Fig. 4) legless, creamy white, with brown head capsule,

Pupa: White, similar in size and shape to the adult weevil.

Adult: Rather large and robust, 12-16 mm long, 6-7 mm wide; dull black flecked with grey-white scales; hindwings not developed (Fig. 5).

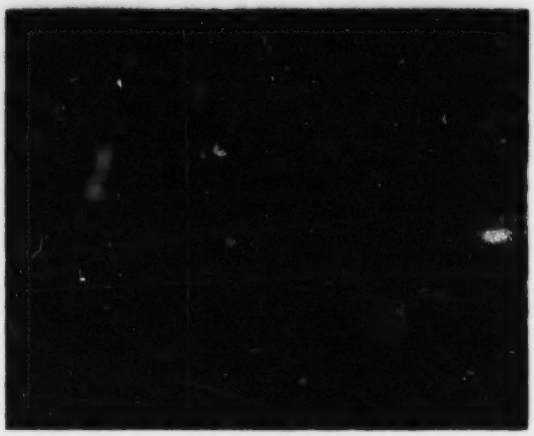

Fig. 6. Circumferential feeding damage.

Life history and habits

Warren's root-collar weevil is long-lived, requiring 2 years to complete the larval stage; adults may live up to 5 years. A female begins to oviposit in her second year and during her lifetime may lay up to 40 eggs averaging about 12 eggs per year. Oviposition occurs between May and September, but is greatest during July. Eggs are laid either in cracks in the bark of the root collar or in the adjacent duff layer.

Larvae hatch in about 2 weeks and bore into the bark and cambium of the root collar or the basal area of the roots. Feeding generally progresses circumferentially in the root-collar area (Fig. 6) causing pitch exudation within which the larvae form tube-like shelters of resin, soil and bark fragments. This resin shelter increases in size and hardness as the larvae mature. Small trees usually support one or two larvae but may rarely have up to four larvae. Populations in excess of 30 larvae may be found on larger trees. With the arrival of cold weather, the larvae stop feeding and overwinter as second to fourth instar larvae. Feeding activity resumes in spring after the soil has warmed sufficiently, and continues until fall. The nearly mature larvae overwinter, completing the sixth and final instar in spring. Pupation occurs in early summer, at the end of a pitch tunnel sealed off to form a pupal cell.

Adults emerge in fall or the following spring. The nocturnally feeding adults ascend the trunk to the lower branches of host conifers where they chew through to the sapwood on the upper surface of small branches. Movement of flightless adults searching for new host trees is usually no more than 10 to 13 m in a year.

Damage and detection

Most damage is caused by the larvae which destroy the cambium and phloem in the root-collar zone. They may completely girdle the trunk at the root collar (Fig. 7) or the basal portions of the larger lateral roots, particularly on smaller trees. As the trees mature, the area of current weevil attack tends to shift to the roots. Large trees are seldom completely girdled at the root collar, but their main roots may be girdled, especially near root crotches. If sufficient amounts of tissue are killed, a smaller tree may be killed or severely weakened and windthrown. Mortality of larger trees seldom occurs but feeding damage may cause some growth reduction. Decay fungi may be associated with weevil damage and may accelerate the decline. Tree mortality exceeding 10% has been found in some young lodgepole pine plantations in British Columbia.

Lodgepole pine first becomes susceptible to attack at about 6 to 8 years age and 1.5 to 2 m height, and may continue to sustain injury through to maturity. Dominant and codominant trees are often preferred, as are trees growing on somewhat moist sites with coarse-textured soils and deep duff layers.

Mortality usually occurs as single trees or in small groups randomly scattered throughout a stand. Weevil attack in young stands may develop from populations in adjacent unlogged areas, residual uncut trees or infested stumps within the clearcut. Infestations may be confirmed by removing the duff and inspecting the root collar or basal area of the roots for the presence of pitch formations or feeding damage. The deep red or straw-colored foliage of weevil-killed trees contrasts sharply

Fig. 7. Immature tree girdled by root-collar weevils.

Fig. 8. Leaning trees weakened by root-collar weevils.

with surrounding healthy trees. Trees with current weevil attack, but lacking obvious foliage discoloration, may show a reduction in terminal growth or have severely weakened root systems; they may lean or be easily pushed over (Fig. 8). Positive identification may necessitate careful examination of the root-collar area since Armillaria root disease can cause somewhat similar stress symptoms on young trees (Morrison 1981).

Control

Few natural parasites or predators of this weevil are known. A hymenopterous parasite *Dolichomitus tuberculatus* (Geoffroy) causes some mortality. *Beauveria bassiana* (Bals.) a common fungus disease of insects attacks the larval, pupal and adult stages.

Silvicultural strategies that could reduce losses in young stands established after logging include clearcutting of infested stands ensuring that no residual host trees are left, increasing the size of clearcuts, and scarification or a prescribed burn of the site. These measures would remove any stumps infested with root-collar weevils, reduce the duff habitat that adults prefer and slow the rate at which weevils recolonize the site from surrounding uncut timber. Since the adult weevils preferentially attack at shaded sites within the duff layer, removal of the duff around the root collar or pruning of lower branches on young trees, or both, could reduce the probability of attack. Alternatively, where possible, less-susceptible tree species such as Douglas-fir, true firs, hemlock and cedar could be planted on sites with high weevil populations.

References

Cerezke, H.F. 1970. Biology and control of Warren's collar weevil, *Hylobius warreni* Wood, in Alberta. Can. For. Serv. Internal Report A-27, 28 pp.

Cerezke, H.F. 1970. A method for estimating abundance of the weevil, *Hylobius warreni* Wood, and its damage in lodgepole pine stands. For. Chron. 46(5): 392-396.

Cerezke, H.F. 1973. Survival of the weevil, *Hylobius warreni* Wood, in lodgepole pine stumps. Can. J. For. Res. 3(3): 367-372.

Cerezke, H.F. 1974. Effects of partial girdling on growth in lodgepole pine with application to damage by the weevil *Hylobius warreni* Wood. Can. J. For. Res. 4(3): 312-320.

Drouin, J.A., C.R. Sullivan and S.G. Smith. 1963. Occurrence of *Pissodes terminalis* Hopp. (Coleoptera: Curculionidae) in Canada: Life history, behavior and cytogenetic identification. Can. Entomol. 95: 70-76.

Grant, J. 1966. The hosts and distribution of the root collar weevils, *Hylobius pinicola* (Couper) and *H. warreni* Wood, in British Columbia. J. Entomol. Soc. British Columbia 63: 3-4.

Maher, T.C. 1979. The Biology and impact of the lodgepole terminal weevil in the Cariboo Forest Region. M.Sc. Thesis, Univ. British Columbia, Vancouver, B.C. 63 pp.

Morrison, D.J. 1981. Armillaria root disease a guide to disease diagnosis, development and management in British Columbia. Can. For. Serv., Pac. For. Res. Cent. Inf. Rep. BC-X-203, 15 pp.

Stark, R.W. and D.L. Wood. 1964. The biology of *Pissodes terminalis* Hopping (Coleoptera: Curculionidae) in California. Can. Entomol. 96: 1208-1218.

Stevens, R.E. and J.A.E. Knopf. 1974. Lodgepole terminal weevil in interior lodgepole pine forests. Environ. Entomol. 3: 998-1002.

Warren, G.L. 1956. Root injury to conifers in Canada by species of *Hylobius* and *Hypomolyx* (Coleoptera: Curculionidae). For. Chron. 32(1): 7-10.

Canadian Forestry Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C. V8Z 1M5

Phone (604) 388-0600

Canada

© Minister of Supply & Services Canada, 1986